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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/944,832	08/31/2001	Lawrence Jacobs	OR01-03301	3411

51067 7590 05/04/2005

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EXAMINER

CHOI, WOO H

ART UNIT	PAPER NUMBER
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2189

DATE MAILED: 05/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/944,832

Applicant(s)

JACOBS ET AL.

Examiner

Woo H. Choi

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 February 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 91-141 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 91-141 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

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DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 91 – 125 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Independent claims 91 and 112, recite the limitation “if so, storing said first data object.” There are two “if” conditions prior to this limitation, each of which has an action associated with it already. It is not clear which of the two “if” conditions, if any, this limitation is associated with. In the remarks section of the amendment, Applicant seems to associate the “if so” limitation with the outcome of the “determining” step of the second if condition. However, the text of the amended claim does not support such an association. The determining step is not one of the “if” conditions, it is an action step in one of the if statements. For the purposes of this examination this limitation will be interpreted as being associated with either one of the two conditions.

Dependent claims are rejected for containing the deficiencies of their respective parent claims.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 91 – 99, 101 – 103, 109 – 116, 119 – 120, 122, 124 – 128, 130 – 132, 134, 136 – 139 and 141 are rejected under 35 U.S.C. 102(e) as being anticipated by Wu *et al.* (US Patent No. 6,370,620, hereinafter “Wu”).

With respect to claims 91 – 93, 98, 112, 137 and 138, Wu discloses a method of caching a data object, comprising:

receiving at a first cache of a plurality of cooperating caches a first data object of a domain of data objects (figure 6);

if said first data object is owned by the first cache, storing said first data object as primary content in the first cache (figure 2, object 104 is stored); and

if said first data object is owned by another cache in the plurality of caches, determining on the basis of a set of dynamic criteria whether to store said first data object as secondary content in the first cache (figure 3, figure 3, 203 and figure 4, 305, determining whether to store or discard a non-assigned partition object in the local LRU stack is based on the membership in

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the LRU cache, which changes dynamically, for example, if a requested object is member, it is kept in the cache, if not and the non-assigned objected is at the bottom of the stack, it is discarded); and

if so, storing said first data object as secondary content in the first cache (figure 2, 103 is stored as a secondary content, secondary content is distinguished from the primary as they are evicted from the cache without being moved to the regular LRU stack);

wherein said first data object is owned by one and only one of the plurality of caches (figure 5, step 404, see also col. 1, lines 36 – 61); and wherein

wherein a ratio between primary content and secondary content in the first cache is allowed to fluctuate (the ratio changes every time an inserted object does not replace an object of the same type).

5. With respect to claims 94, 113, 116, 126, and 141, Wu discloses a method of caching data objects in a plurality of cooperating caches, comprising:

partitioning a set of data objects among a plurality of cooperating caches, wherein each of said caches receives ownership of a subset of said data objects (col. 1, lines 36 – 61);

caching one or more data objects of a first subset of said data objects at a first cache having ownership of said first subset (abstract and figure 2);

caching one or more data objects of a second subset of said data objects at the first cache as secondary content (secondary content 103 is clearly distinguished from primary content 104), wherein a second cache in the cluster owns said second subset (abstract and figure 2);

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receiving at the first cache a first request for a first data object in said second subset of data objects (figure 5, see step 405);

receiving said first data object from the second cache (figure 6, 501); and

caching said first data object at the first cache only if said first data object satisfies one or more of a predetermined set of criteria (one criterion for caching is that the object be requested, another one is that it is received by the cache, yet another one is that it does not satisfy the conditions for removal from the local LRU, see figure 2 and col. 3 lines 24 – 52).

6. With respect to claims 127 and 136, Wu discloses a method of caching data objects in a plurality of cooperating caches, comprising:

partitioning a domain of data objects among a plurality of cooperating caches, wherein a first cache receives ownership of a first subset of said data objects (figure 2, col. 1, lines 36 – 61);

caching one or more members of said first subset of data objects at the first cache (figure 2, 104);

caching one or more members of a second subset of data objects at the first cache, wherein a second cache owns said second subset of data objects (figure 2, 103, 106); and

removing a first cached data object from said first cache, wherein said first data object is identified by applying a predetermined set of criteria (106, figure 4, see also col. 8, lines 13 – 27).

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7. With respect to claims 95, 114, 117, 128 and 139, said set of dynamic criteria includes a popularity of said first data object (col. 4, lines 25 – 31, non-assigned partition object only stays in cache if it is frequently accessed, i.e. popular, see also col. 8, lines 17 – 19).

8. With respect to claims 96, 122 and 134, set of dynamic criteria includes a utilization of the first cache (as discussed above, frequently utilized objects are kept in the cache).

9. With respect to claim 97, 102, 119 and 130, set of dynamic criteria includes a size of said first data object (col. 8, lines 22 – 24).

10. With respect to claim 99, said one or more characteristics include popularity;
wherein said popularity is measured as one or more of:

a number of requests for said cached data object; and

a frequency of requests for said cached data object (col. 8, lines 17 – 19).

11. With respect to claims 101, 120 and 131, said one or more criteria include age (figure 4, 305, the object at the bottom of the LRU list, i.e. least recently used or oldest in the access list, is removed).

12. With respect to claims 103 and 132, said one or more criteria include ownership (figure 4, 303, 306, 305).

13. With respect to claim 109, the method further comprises:

exchanging a configuration of the plurality of cooperating caches between the first cache and a second cache (figure 5, 402 – 405, caches must have configuration information of other caches to operate in a manner described in figure 5, for example, a cache must have information on other caches to determine the proper owner of an object and forward a request to the right owner, also CARP protocol, col. 1, lines 36 – 60, defines a Proxy Membership Table, containing configuration information for cooperating caches, that is used by the array of caches).

14. With respect to claims 110, 111, 124 and 125, the method further comprises:

re-configuring ownership of the domain of data objects in response to the removal and addition of a cache from the plurality of cooperating caches (figure 7, col. 5, lines 9 – 17).

15. With respect to claim 115, said caching said first data object comprises caching said first data object if the first cache has capacity to cache said first data object without first removing another data object (figure 4, steps 301 and 304).

16. Claims 91, 98, 105 – 107, 112, 113, 126, 127, 136, 137 and 141 are rejected under 35 U.S.C. 102(e) as being anticipated by Dias *et al.* (US Patent No. 6,317,778, hereinafter “Dias”).

17. With respect to claims 91, 98, 112, 113, 126, 127, 136, 137, and 141, Dias discloses a method of caching a data object, comprising:

receiving at a first cache of a plurality of cooperating caches a first data object of a domain of data objects (figure 3);

if said first data object is owned by the first cache, storing said first data object in the first cache (figure 1B, 197, and figure 3, 340) ; and

if said first data object is owned by another cache in the plurality of caches, determining on the basis of a set of dynamic criteria whether to store said first data object in the first cache (figure 2, replacement/duplication decision is based on calculated desirability values, col. 4, lines 41 – 54, cache objects are duplicated in multiple caches, i.e. non-primary owners can cache objects, col. 5, lines 19 – 23, metrics are used to dynamically adjust and improve performance); and

if so, storing said first data object as secondary content in the first cache (see above, non-primary owners can cache objects)

wherein said first data object is owned by one and only one of the plurality of caches (figure 1B, 196 and 197).

18. With respect to claims 105 – 107, one or more criteria include utilization of server, cache, and network I/O resources between a cache array and a server cluster (col. 4, lines 62 – 67).

Claim Rejections - 35 USC § 103

19. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

20. Claims 98, 113, 118, 127 and 129 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jordan *et al.* (US Patent Application Pub. No. 2002/0026560, hereinafter “Jordan”) in view of Challenger *et al.* (US Patent No. 6,266,742, hereinafter “Challenger”).

21. With respect to claim 113, Jordan discloses a method of caching data objects in a plurality of cooperating caches, comprising:

partitioning a set of data objects among a plurality of cooperating caches, wherein each of said caches receives ownership of a subset of said data objects (figure 2A);

caching one or more data objects of a first subset of said data objects at a first cache having ownership of said first subset (page 3, paragraph 27);

caching one or more data objects of a second subset of said data objects at the first cache as secondary content, wherein a second cache in the cluster owns said second subset (page 3, paragraph 27, requesting cache server obtains objects that it does not own from owning servers, see also page 4, paragraph 31, a server maintains objects that it does not own);

receiving at the first cache a first request for a first data object in said second subset of data objects;

receiving said first data object from the second cache (page 3, paragraph 27, see also page 5, paragraph 38, request forwarding cache server receives and caches objects owned by other servers)

However, Jordan does not specifically disclose caching of said first data object at the first cache only if said first data object satisfies one or more of a predetermined set of criteria. On the

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other hand, Challenger discloses a conditional caching algorithm (abstract, figure 4, steps 440 – 480).

It would have been obvious to one of ordinary skill in the art, having the teachings of Jordan and Challenger before him at the time the invention was made, to use the conditional caching teachings of web caching system of Challenger in the web caching system of Jordan, in order to be able to balance the expense of caching with the benefits (Challenger, col. 2, lines 38 – 40).

22. With respect to claim 98, 118, 127 and 129, said predetermined set of criteria includes a validity of said first data object (col. 4, lines 24 – 24, invalidate objects are removed, i.e. not cached, metrics or criteria are dynamically calculated, see figure 4).

23. Claims 104, 121 and 133 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu in view of Challenger.

Wu discloses all of the limitations of the parent claims as discussed above. However, Wu does not specifically disclose that said one or more criteria include a cost of retrieving said cached data object from one of an origin server and a second cache in the plurality of caches. On the other hand, Challenger discloses a conditional caching method that includes a cost of retrieving in a caching decision (abstract, time to calculate and/or fetch the object is one of the metrics used to make caching decisions, see also figure 4).

It would have been obvious to one of ordinary skill in the art, having the teachings of Wu and Challenger before him at the time the invention was made, to use the conditional caching teachings of web caching system of Challenger in the web caching system of Wu, in order to be able to balance the expense of caching with the benefits (Challenger, col. 2, lines 38 – 40).

24. Claims 108, 123, 135 and 140 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wu in view of Wang (US Patent Application Pub. No 2002/0184368).

Wu discloses all of the limitations of the parent claim as discussed above. However, Wu does not specifically disclose propagation of invalidation of said first data object between the first cache and a second cache. On the other hand, Wang discloses a method of propagating web cache invalidation messages among web cache servers (page 6, paragraphs 154 – 157).

It would have been obvious to one of ordinary skill in the art, having the teachings of Wu and Wang before him at the time the invention was made, to use the multi-level hierarchical service network that invalidates caches using a directory information routing protocol teachings of the web caching system of Wang in the web caching system of Wu, in order to help maintain the cache freshness for a hierarchical content delivery network (page 1, paragraph 1).

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Response to Arguments


25. Applicant's arguments filed March 31, 2005 have been fully considered but they are not persuasive. First of all, the Examiner notes that Applicant only discusses Wu reference and does not address rejections based on the Dias and Jordan references. The Examiner also notes that the argument presented seems to apply to claims 113 and 127 only. See the rejections of these claims above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Woo H. Choi whose telephone number is (571) 272-4179. The examiner can normally be reached on M-F, 9:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt Kim can be reached on (571) 272-4182. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Woo H. Choi
April 29, 2005